# Internet Robot Operation Manual

## 1. Software Requirements

(1) Windows XP/2000 Operation System with internet connection

(2) Skype Software for Windows XP/2000:

Free download from: http://www.skype.com/, also a Skype user account to log on Skype network.

(3) Robot teleoperation software (client side) File name: WebRobotClient.exe. Free downloaded from:

http://www.me.hawaii.edu/HRIL/robotinterface.html/

## 2. Instructions for Starting Software and Connecting to Robot Server

(1) Start your Skype software and log on Skype network, now you should be able to talk with your friends through Skype.

(2) Start WebRobotClient.exe, you should notice the following warning. In order to let WebRobotClient.exe access Skype, you must choose "Allow this program to use Skype" or "Allow this program to use Skype, but ask again in the future", then click "OK" button.
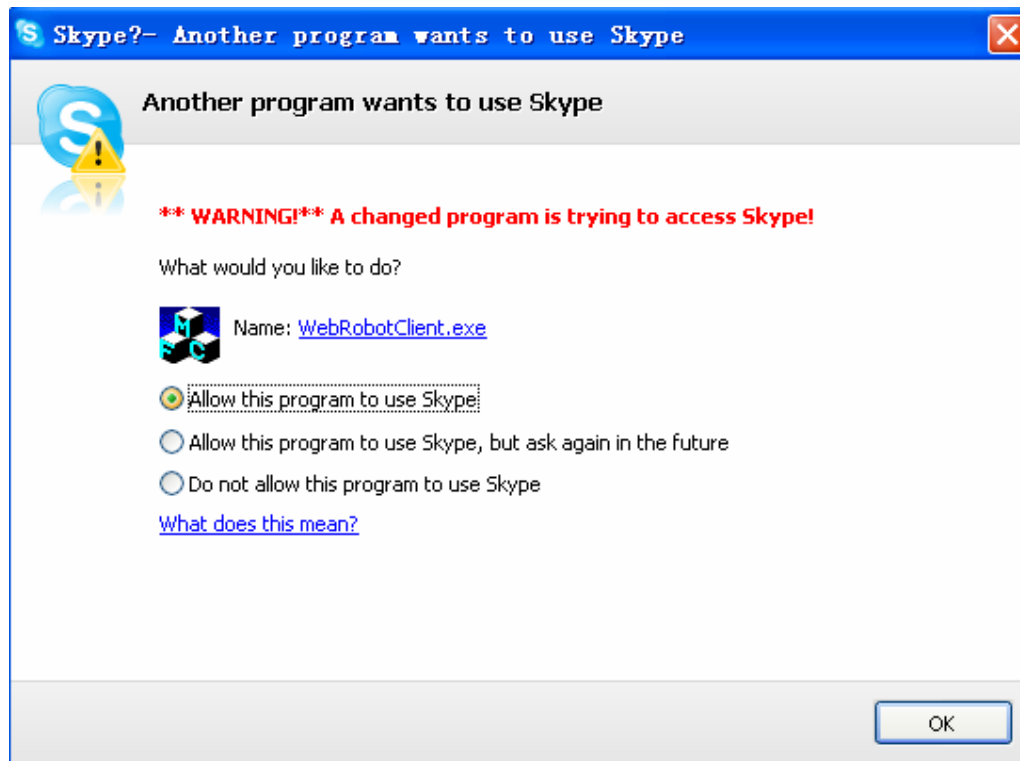


(3) Now the WebRobotClient.exe is started as the following picture. The WebRobotClient.exe is trying to find the robot server automatically. Once the connection with the server is established, you should see the queue of other users waiting for robot operation and the estimated time for your place. Keep the software running and wait.

If you are not be able to see any connections in 30 seconds after starting WebRobotClient.exe. You should close WebRobotClient by clicking the cross in the up-right corner. Then start the WebRobotClient.exe and try again.
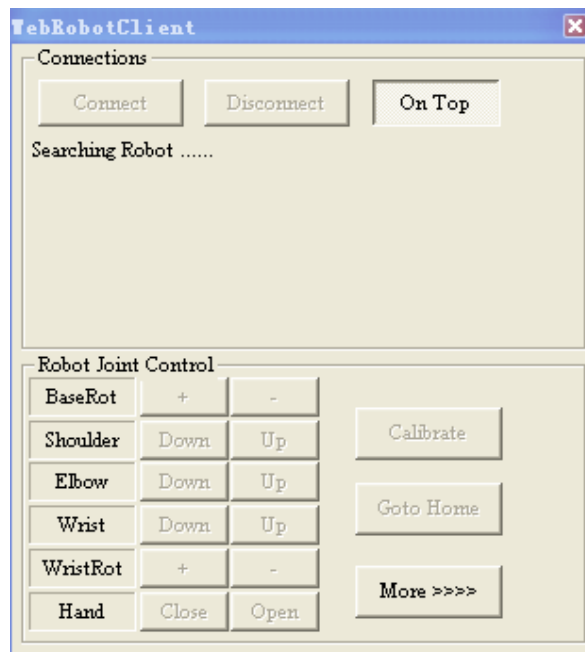


(4) Once it's your place to operate the webrobot, the "Connect" button will be activated. Now you click "Connect" button.
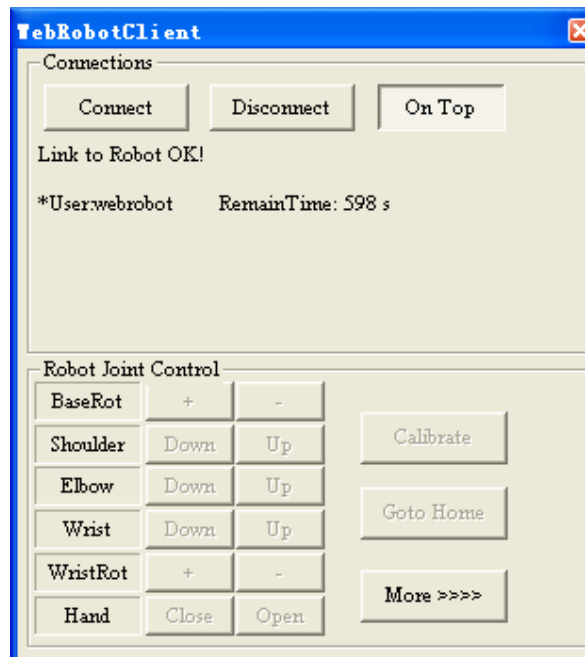


(5) After just few seconds (3-10 seconds), you should see robot video in the Skype software. Some times Skype will ask your permission to receive video like the following figure, just click "OK" to receive video from robot.
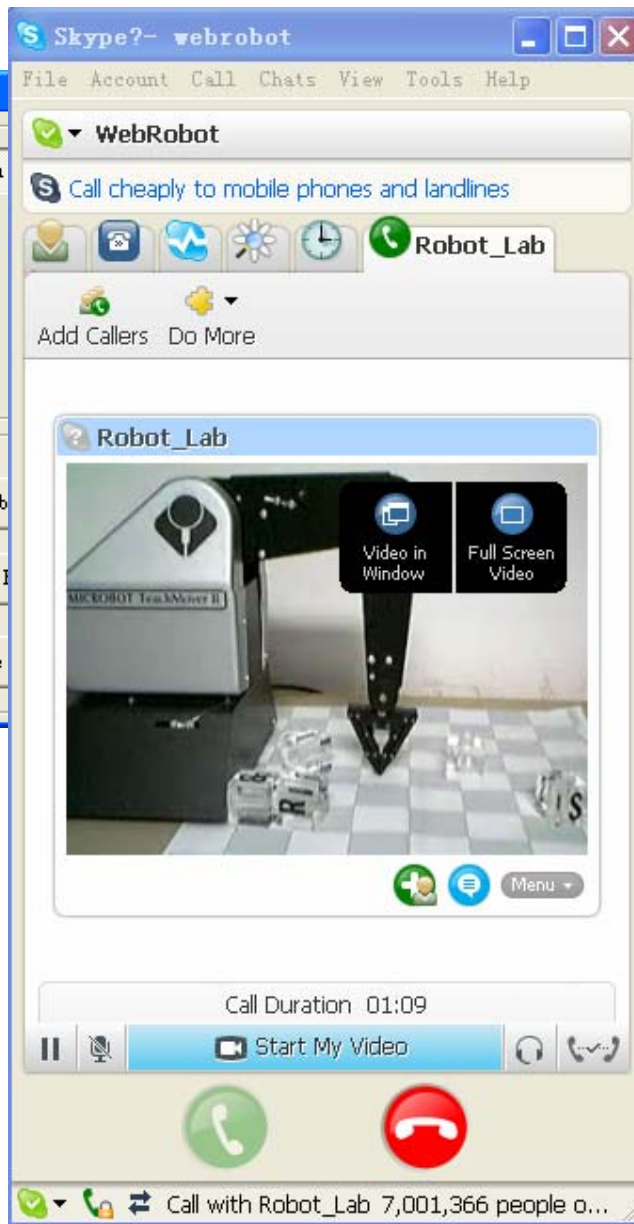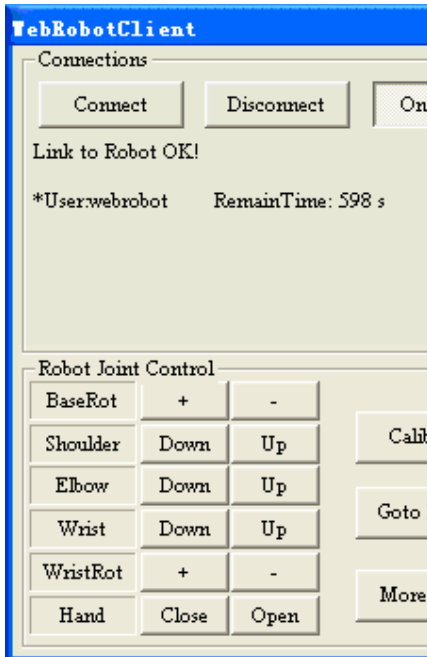
(6) Enlarge the video by choosing the "Video in Window" or "Full Screen Video" in the figure above, now you can see WebRobotClient software is on top of the robot video. Now you can operate the robot through internet.



## 3. Instructions for Client Software for Operating Robot

There are four kind of operations in the client software which are labled in the following figure.

(1) Connection Control and Connection Status

Control the data connection or disconnection to the robot server if it's your place to control the robot. The robot status and other users status are displayed.

(2) Robot Joint Control

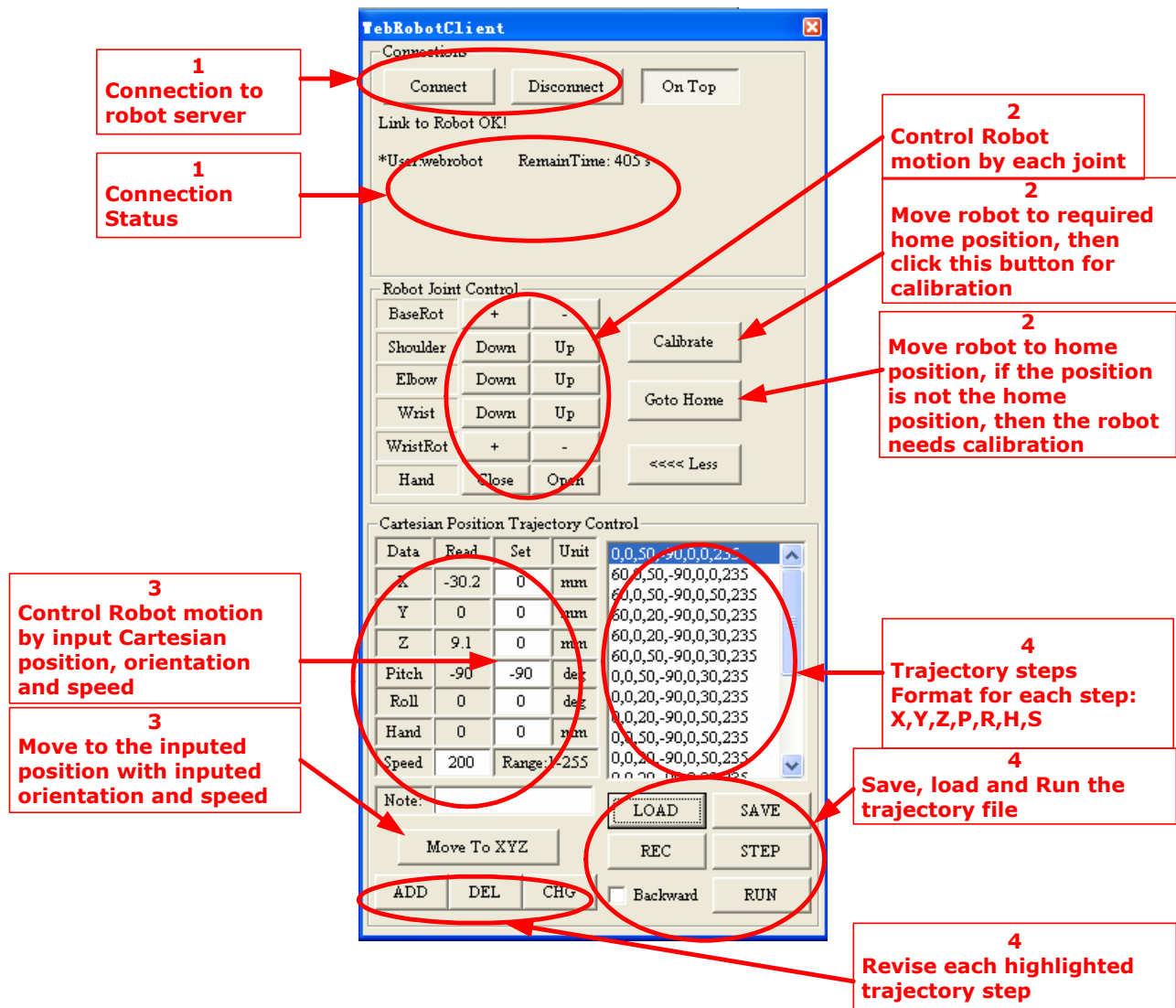Control robot each joint's motion by clicking these buttons.

(3) Cartesian Position Control

Control robot to move to set Cartesian position and orientation.

(4) Trajectory Control

You can edit, load, save and record trajectory file. Then click "run" button, the robot will execute each trajectory step continuously. Or you can click "step" button to let robot execute each trajectory step by step.

**WebRobotClient**

Connections
Connect    Disconnect    On Top

Link to Robot OK!

*User:webrobot    RemainTime: 405 s

Robot Joint Control
BaseRot    +    -
Shoulder    Down    Up          Calibrate
Elbow    Down    Up
Wrist    Down    Up          Goto Home
WristRot    +    -
Hand    Close    Open          <<<< Less

Cartesian Position Trajectory Control

| Data | Read | Set | Unit |
|------|------|-----|------|
| X | -30.2 | 0 | mm |
| Y | 0 | 0 | mm |
| Z | 9.1 | 0 | mm |
| Pitch | -90 | -90 | deg |
| Roll | 0 | 0 | deg |
| Hand | 0 | 0 | mm |
| Speed | 200 | Range:1-255 | |

0,0,50,-90,0,0,235
60,0,50,-90,0,0,235
60,0,50,-90,0,50,235
60,0,20,-90,0,50,235
60,0,20,-90,0,30,235
60,0,50,-90,0,30,235
0,0,50,-90,0,30,235
0,0,20,-90,0,30,235
0,0,20,-90,0,50,235
0,0,50,-90,0,50,235
0,0,20,-90,0,50,235

Note:

Move To XYZ          LOAD    SAVE
                     REC     STEP
ADD    DEL    CHG    □ Backward    RUN

**Annotation labels:**

1 Connection to robot server

1 Connection Status

2 Control Robot motion by each joint

2 Move robot to required home position, then click this button for calibration

2 Move robot to home position, if the position is not the home position, then the robot needs calibration

3 Control Robot motion by input Cartesian position, orientation and speed

3 Move to the inputed position with inputed orientation and speed

4 Trajectory steps Format for each step: X,Y,Z,P,R,H,S

4 Save, load and Run the trajectory file

4 Revise each highlighted trajectory step

## 4. Robot Home Position and Calibration

Before the Cartesian position control, the robot should be calibrated to get correct and accurate motion. To check if the robot needs calibration then to calibrate it, here are some steps.

(1) The robot Cartesian coordinate is defined in the figure. And its home position is in the origin of the coordinate frame (x=0,y=0,z=0). The home position is marked on the floor for recognition.

In the home position, the robot elbow joint and wrist joint are pointing downward, the base joint is in the center, the gripper joint is closed and contact on the floor..

(2) Click "Goto Home" then "OK" button, the robot should move to the home

position shown in the figure. If the robot position is not same as the home position in the figure, then the robot needs calibration.
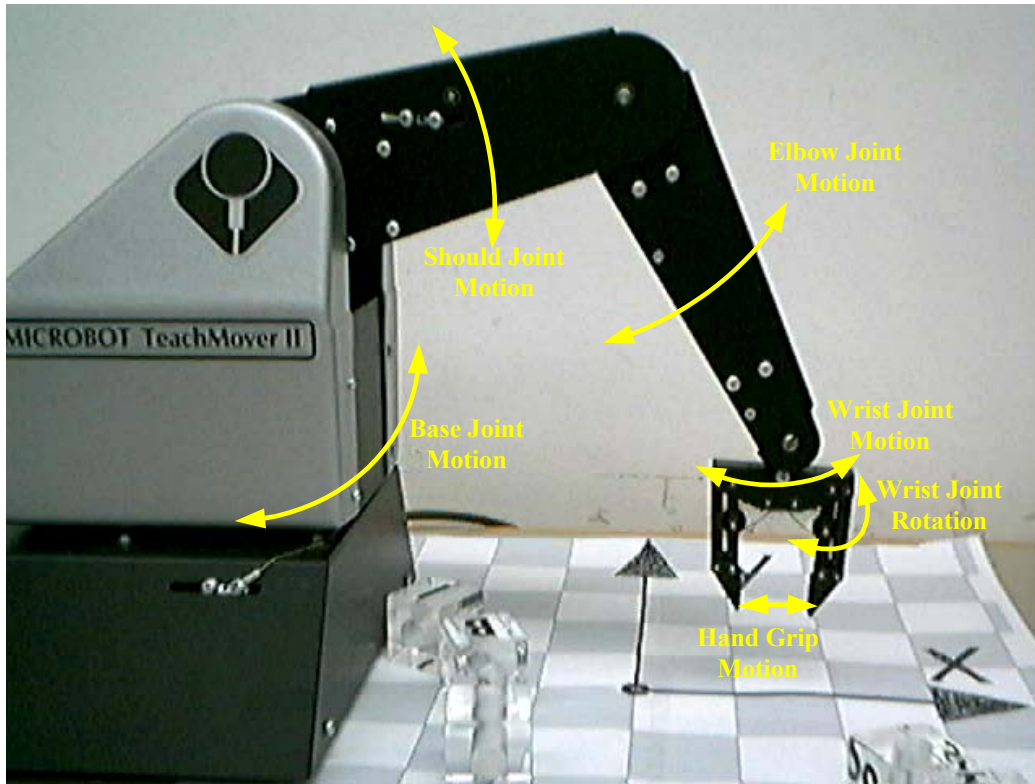
(3) Move robot to desired home position by clicking robot joint control buttons, then click "Calibrate" then "OK", now the robot is calibrated.



The Robot In Its Home Position (The size of each square on the floor is 50mm)
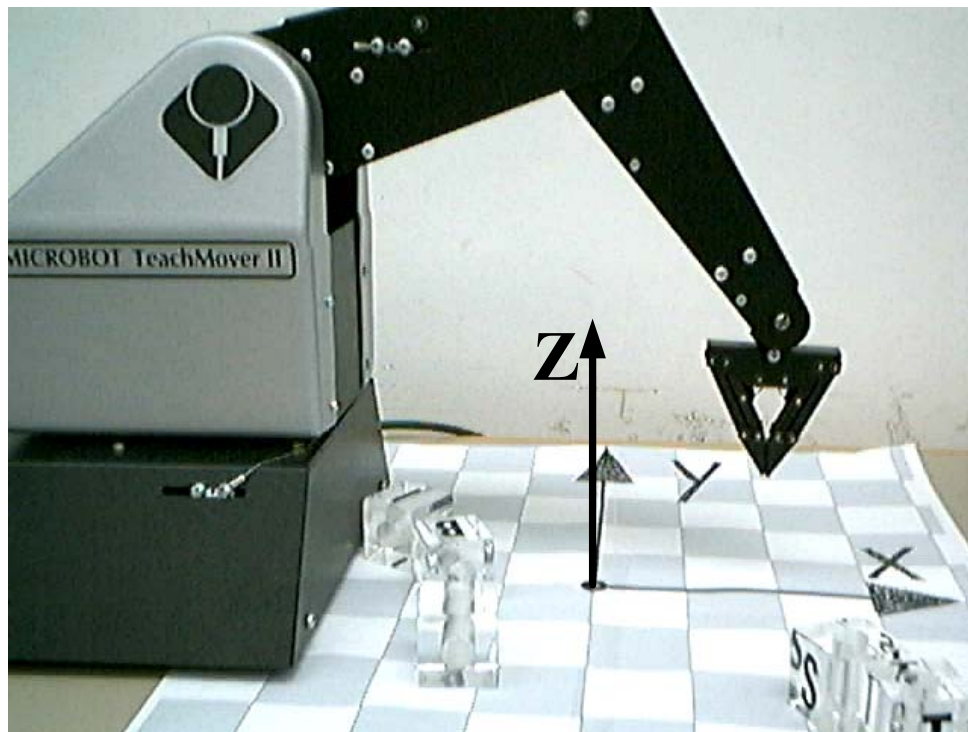


Cartesian Frame of Robot

Robot Joints